

## CLAIMS

What is claimed is:

1. An apparatus for holding at least one optical fiber, said apparatus comprising:
  - a) a top plate having an output face, a first attaching face and a first through hole having a first narrow section terminating at said output face and a first expanding section terminating at said attaching face;
  - b) a bottom plate having a second attaching face, an insertion face and a second through hole having a second narrow section terminating at said second attaching face and a second expanding section terminating at said insertion face;
  - c) a spacer plate sandwiched between said first attaching face and said second attaching face, said spacer plate having a third through hole of wide uniform diameter aligned with said first through hole and said second through hole such that said at least one optical fiber has a feedthrough from said insertion face to said output face.
2. The apparatus of claim 1, wherein said first narrow section has a first uniform diameter and said second narrow section has a second uniform diameter larger than said first uniform diameter.

1           3.    The apparatus of claim 2, wherein said first  
2               uniform diameter is essentially equal to a fiber  
3               diameter of said optical fiber.

1           4.    The apparatus of claim 1, wherein said first expanding  
2               section has a tapered cross section.

1           5.    The apparatus of claim 1, wherein said second  
2               expanding section has a tapered cross section.

1           6.    The apparatus of claim 1, further comprising a fiber  
2               housing for mounting said insert.

1           7.    The apparatus of claim 6, wherein said fiber  
2               housing comprises a front portion and said insert  
3               is mounted on said front portion.

1           8.    The apparatus of claim 6, further comprising an  
2               external housing for hermetically sealing an  
3               interior of an optical device while said  
4               apparatus is attached to said optical device.

1           9.    The apparatus of claim 8, wherein said  
2               external housing comprises a glass plate  
3               disposed in a plane-parallel orientation  
4               with said insert.

1               10. The apparatus of claim 9, further  
2               comprising an optical gel interposed

3                   between said glass plate and said  
4                   insert.

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1           11. The apparatus of claim 8, wherein said  
2           external housing comprises a lens plate  
3           having at least one lens for focusing a  
4           light beam traveling along an optical axis  
5           of said at least one optical fiber.

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1           12. The apparatus of claim 11, further  
2           comprising a means for fixing said lens  
3           plate in a tuned position.

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1           13. The apparatus of claim 1, wherein a number of said at  
2           least one optical fiber are combined with a first  
3           spacing in a fiber array and wherein a number of said  
4           feedthrough is provided with a second spacing  
5           corresponding to said first spacing such that fiber  
6           ends of said fiber array may be simultaneously  
7           inserted into said number of said feedthrough.

1 14. An apparatus for hermetically holding at least one optical  
2 fiber, said apparatus comprising:

3 a. an insert comprising:

4 i. a top plate having an output face, a first  
5 attaching face and a first through hole having a  
6 first narrow section terminating at said output  
7 face and a first expanding section expanding  
8 towards and terminating at said attaching face;

9 ii. a bottom plate having a second attaching face, an  
10 insertion face and a second through hole having a  
11 second narrow section terminating at said  
12 attaching face and second expanding section  
13 expanding towards and terminating at said  
14 insertion face;

15 iii. a spacer plate sandwiched between said first  
16 attaching face and said second attaching face,  
17 said spacer having a third through hole of a  
18 diameter larger than said first narrow section  
19 and said second narrow section;

20 wherein said first through hole, said second through  
21 hole and said third through hole being positioned  
22 relative to each other such that a feedthrough is  
23 provided such that said fiber approaching said second  
24 expanding section is guided towards said second narrow  
25 section and such that said fiber approaching said top  
26 plate through said third hole is captured by said  
27 first expanding section and guided towards said first  
28 narrow section; and

29           b.   a glass plate hermetically connected to said output  
30           face via an optical gel such that an end of said fiber  
31           is hermetically sealed while said fiber is finally  
32           bonded within said feedthrough.

33  
1           15.   The apparatus of claim 14, wherein said top plate is  
2           made of a silicon wafer having a 1-0-0  
3           crystallographic orientation such that said first  
4           expanding section has a taper angle of 57.5 degrees  
5           off normal.

6  
1           16.   The apparatus of claim 14, wherein said bottom plate  
2           is made of a silicon wafer having a 1-0-0  
3           crystallographic orientation such that said second  
4           expanding section has a taper angle of 57.5 degrees  
5           off normal.

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1           17.   The apparatus of claim 14, wherein a number of said  
2           feedthrough is arrayed and spaced in correspondence  
3           with an combined array of a number of said optical  
4           fiber.

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1           18.   The apparatus of claim 14, wherein said insert is  
2           attached at a fiber housing.

3  
1           19.   The apparatus of claim 18, wherein said fiber  
2           housing has a lateral opening for holding said  
3           optical fiber during said approaching of it.  
4

1 20. The apparatus of claim 18, wherein said glass  
2 plate is attached at an external housing  
3 configured in conjunction with said fiber housing  
4 such that said insert is positioned in a  
5 substantially parallel distance to said glass  
6 plate.

7  
1 21. The apparatus of claim 20, wherein said  
2 external housing and said fiber housing  
3 further comprise:

4 a. a cavity surrounding said insert, said  
5 cavity being formed by said external  
6 housing together with said fiber  
7 housing; and

8 b. a tensioning means for applying a  
9 compressive force via said glass plate  
10 and said output face onto said optical  
11 gel in uncured configuration such that  
12 an excess amount of said uncured  
13 optical gel flows into said surrounding  
14 cavity.

15  
1 22. An apparatus for hermetically holding fiber ends, said  
2 apparatus comprising:

3 a. an external housing having a glass plate;

4 b. an internal structure including:

5 i. an combined array of said fiber ends, said fiber  
6 ends continuing as optical fibers ;

- 7           ii. a three plate insert having an array of  
8           feedthroughs holding said fiber ends opposite to  
9           said glass plate, at least one of said  
10          feedthroughs positioning one of said fiber ends  
11          in a first narrow hole section of an insert's top  
12          plate and in a second narrow hole section of an  
13          insert's bottom plate;  
14          iii. a fiber housing for holding said three plate  
15          insert and for interlocking with said external  
16          housing; and  
17          c. an optical gel filling a gap between said glass plate  
18          and said insert.

19  
1          23. The apparatus of claim 22, wherein said top plate has  
2          a first expanding hole section substantially aligned  
3          with said first narrow hole section and expanding  
4          towards an insertion direction of at least one of said  
5          fiber ends.

6  
1          24. The apparatus of claim 22, wherein said bottom plate  
2          has a second expanding hole section substantially  
3          aligned with said second narrow hole section and  
4          expanding towards an insertion direction of at least  
5          one of said fiber ends.

6  
1          25. A method for positioning and attaching a frame to a housing,  
2          said method comprising the following steps of:  
3                  a. providing solder pins on said housing such that said  
4                  solder pins reach within holes of said frame with a

gap that provides a predetermined adjustment range of  
said frame relative to said housing;

- b. positioning said frame relative to said housing while  
said solder pins reach into said holes; and
- c. soldering said gap.

26. The method of claim 25, wherein a lens plate is  
attached to said frame.

27. The method of claim 25, wherein said housing is part  
of an optical connector.